TAXONOMIC REVIEW OF *APRISTURUS LAURUSSONII* (SAEMUNDSSON, 1922) FROM THE EASTERN NORTH ATLANTIC (ELASMOBRANCHII: SCYLIORHINIDAE)

by

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ABSTRACT. - *Apristurus laurussonii* (Saemundsson, 1922) from Icelandic waters is taxonomically reviewed, and *A. maderensis* Cadenat & Maul, 1966, from the waters of Madeira is concluded as a junior synonym of *A. laurussonii*.

RÉSUMÉ. - Révision taxinomique de *Apristurus laurussonii* (Saemundsson, 1922) du nord-est Atlantique (Elasmobranchii: Scyliorhinidae).

La comparaison de la roussette d'Islande, *Apristurus laurussonii* (Saemundsson, 1922) avec celle de Madère, *Apristurus maderensis* Cadenat & Maul, 1966, conduit à considérer cette dernière comme un synonyme junior de la première.

Key-words. - Scyliorhinidae, *Apristurus laurussonii*, *A. maderensis*, ANE, Iceland, Madeira, Taxonomic review, Synonymy.

The genus *Apristurus* Garman, 1913 is a large group of deep-water catsharks, and 33 species are currently recognized as valid worldwide. However, this genus contains various taxonomic problems, such as poorly-known and/or incorrectly described species (Compagno, 1984), and many undescribed species (Paulin *et al.*, 1989; Last and Stevens, 1994; Séret, pers. com.). In addition, the synonymy of *Apristurus* species has received little attention with the exception of Nakaya and Séret (1989), Nakaya (1991), and Nakaya and Stehmann (1998).

Several nominal species are known from the North Atlantic Ocean, but they are still questionable from the taxonomic point of view. *Apristurus laurussonii* (Saemundsson, 1922) is the second oldest species in the North Atlantic, and was described on the basis of one specimen collected from the Icelandic waters. Bigelow and Schroeder (1948) considered *A. laurussonii* as a probable synonym of *A. profundorum*. In his review of western Atlantic catsharks, Springer (1966) treated *A. laurussonii* as a distinct species, but he figured a misidentified specimen under the name of *A. laurussoni*. Based on his erroneous understanding of *A. laurussonii*, Springer (1973) further considered *A. atlanticus* as a junior synonym of *A. laurussonii*, but he did not provide explanation for this synonymy. Later, in his taxonomic revision of scyliorhinid sharks of the world, Springer (1979) maintained his 1966 idea of *A. laurussonii*, citing the same figure used in Springer (1966), but he considered *A. atlanticus* distinct from *A. laurussonii*. All subsequent workers, such as Cadenat and Blache (1981), Quéro (1984) and Compagno (1984), conformed to Springer's (1966, 1979) erroneous understanding of *A. laurussonii*. Thus, the Icelandic

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A. laurussonii has never been correctly understood since its original description by Saemundsson (1922).

Later, Cadenat and Maul (1966) described *Apristurus maderensis* from the waters of Madeira as a third species from the eastern North Atlantic. The authors mentioned above considered this to be a distinct species, and no synonymy has been suggested for it.

Our examination of the type specimens of *Apristurus laurussonii* and *A. maderensis* revealed that they are morphologically quite similar to each other. Here we redescribe *A. laurussonii* as a senior synonym of *A. maderensis,* and discuss taxonomic relationships of *A. laurussonii* and *A. maderensis.*

MATERIAL

Apristurus atlanticus

Holotype. - ZMUB 3203, 247 mm in total length (TL), immature male, Canary Islands, 28°08'N, 13°35'W, 1365 m.

Apristurus laurussonii

Holotype. - NHMR (no catalog number given), 663 mm TL, mature female, off Vestmannaeyjar Island, Iceland, 560 m.

Other materials. - ISH 23-1981, 2 specimens, 622 mm TL, mature female and 719 mm TL, mature male, Ymir-Ridge, 59°36.4'N, 08°03.3'W, 100-994 m, "Walther Herwig" station 566/81, 25 Sep. 1981; ISH 109-1981, 592 mm TL, mature female, north west of Ireland, 56°35.1'N, 09°38.4'W, 1250 m, "Walther Herwig" station 627-81, 17 Oct. 1981; ISH 51-1965, 632 mm TL, mature female, south west off Iceland, 63°03'N, 20°30'W, 700-750 m, "Anton Dohrn" station 430/65, 30 Apr. 1965.

Apristurus maderensis

Holotype. - MMF18750, 665 mm TL, mature female, Camara de Lobos, Madeira, 600-1000 m.

METHODS

Measurements were made according to Bigelow and Schroeder (1948) and Nakaya (1975), and terminology of egg capsule follows Cox (1963). Vertebral counts were taken from radiographs, and precaudal diplospondylous counts (those before lower caudal origin) were taken from all non-type specimens. Measurements and counts of the type specimens were taken by Nakaya, and those of other specimens were done by Sato. Institutional acronyms follow Leviton *et al.* (1985) unless otherwise noted.

RESULTS

Apristurus laurussonii (Saemundsson, 1922)

(Figs 1-5)

Scyllium laurussonii Saemundsson, 1922: 73, pl. 4, fig. 2, pl. 5, fig. 4.

Apristurus maderensis Cadenat and Maul, 1966: 796, figs 1-4.

Apristurus maderensis Springer, 1979: 23; Cadenat and Blache, 1981: 186-188, fig. 127; Compagno, 1984: 272-273, figs; Quéro, 1984: 97, figs.

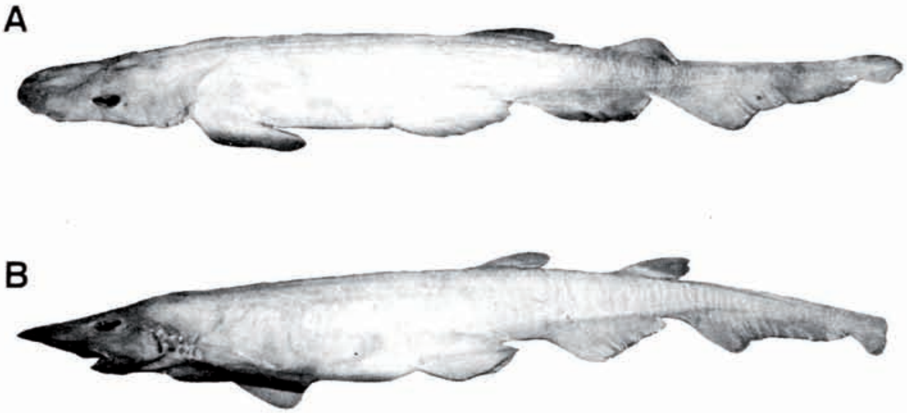

Fig. 1. - Holotypes. (A) *Apristurus laurussonii* (NHMR, 663 mm TL, female); (B) *A. maderensis* (MMF 18750, 665 mm TL, female).

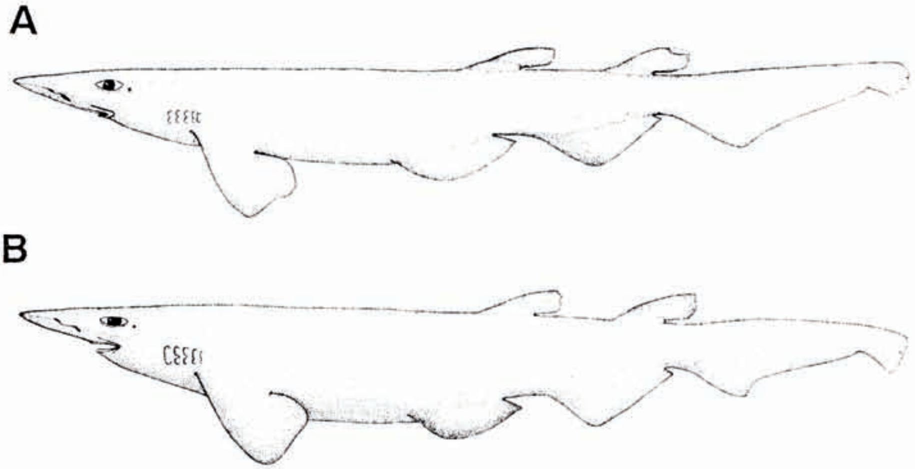

Fig. 2. - Lateral views of the holotypes. (A) *Apristurus laurussonii* (NHMR, 663 mm TL, female); (B) *A. maderensis* (MMF 18750, 665 mm TL, female).

not *Apristurus laurussoni* Springer, 1966: 614-615, fig. 24B; Springer, 1973: 20; Springer, 1979: 21, fig. 14; Compagno, 1984: 270, figs; Quéro, 1984: 96, fig.; Springer, 1990: 90.

Diagnosis

Abdomen long; distance between origins of paired fins much greater than distance from snout tip to pectoral fin, or length of anal fin base. First dorsal fin slightly smaller than second dorsal fin, and its origin above posterior two thirds of pelvic fin base. Anal

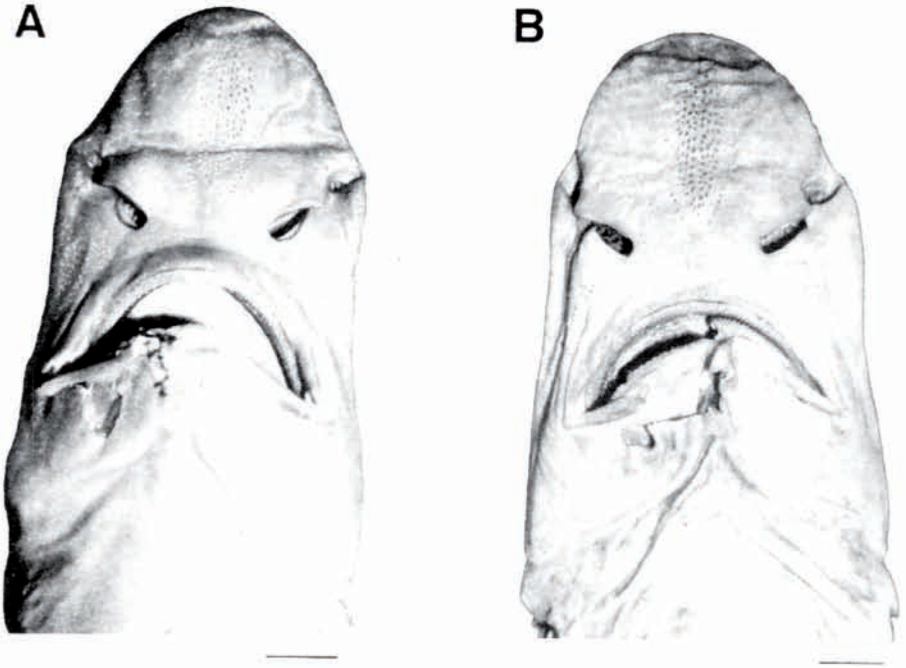

Fig. 3. - Ventral views of the head of the holotypes. (A) *Apristurus laurussonii* (NHMR, 663 mm TL, female); (B) *A. maderensis* (MMF 18750, 665 mm TL, female). Scale bar = 1 cm.

fin high with a short base. Upper labial furrow longer than lower furrow. Teeth numerous, more than 80 tooth rows on both jaws. Numbers of spiral valves 17-20, and monospondylous vertebrae 41-43.

Description

Proportional measurements and counts are given in table I.

Head flattened and bell-shaped anterior to nostrils (Fig. 3); abdomen moderately slender; body behind pelvic fins moderately thin, tapering toward tip of caudal fin. Snout flattened and broad; its tip somewhat blunt; prenarial length longer than internarial width, and a little shorter than half of preoral length. Nostril moderate in size; its greatest diameter always narrower than internarial width, but equal to or slightly greater than horizontal diameter of eye; anterior nasal flap not expanded posteriorly. Eye moderate in size, with an indistinct subocular fold; horizontal diameter of eye about half of interorbital width. Spiracle very small, just behind eye. Mouth large, widely arched and rounded; width always greater than snout length before posterior nostril. Labial furrows on both jaws distinct and long; upper furrow always longer than the lower one, extending beyond middle point between posterior margin of nostril and mouth corner. Gill opening moderate in size; gill septum with or without a posteriorly projecting medial lobe. Pectoral fin large and subangular at rear corners; its anterior margin about equal to length from snout tip to spiracle, always more than 10% TL; posterior margin of pectoral fin not reaching middle point between paired fin bases, when laid back. Pelvic fin moderately large and rounded; its length always more than 11% TL. Interspace between pectoral and pelvic fin

Table I. - Proportional measurements (% of TL) and counts of *Apristurus laurussonii*, *A. maderensis* and *A. atlanticus*.

	A. laurussonii (Holotype) NHMR unregistered	***A. laurussonii*** (4 other materials)	***A. maderensis*** (Holotype) MMF 18750	***A. atlanticus*** (Holotype) ZMB 3203
Total length	663.0 mm	592-719.0 mm	665.0 mm	247.0 mm
Sex	female	1 male and 3 females	female	male
Snout tip to:				
anterior nostril	4.0	3.5 - 4.4	4.3	4.7
posterior nostril	6.6	5.7 - 6.7	6.8	6.6
mouth	8.3	6.8 - 8.6	8.1	8.3
eye	9.3	8.3 - 9.2	9.2	9.8
1st gill opening	17.6	17.1 - 19.4	16.6	17.8
5th gill opening	20.4	20.3 - 22.4	20.4	21.3
1st dorsal origin	50.7	48.1 - 50.7	51.1	47.0
2nd dorsal origin	65.2	63.3 - 65.0	66.2	60.0
anal origin	57.3	54.0 - 54.6	59.7	44.1
lower caudal origin	71.0	69.3 - 70.7	72.6	65.6
pelvic origin	42.5	40.7 - 42.2	43.8	39.7
pectoral origin	19.8	19.4 - 21.8	20.0	21.7
Diameter of:				
eye	3.2	2.5 - 3.4	3.1	3.0
nostril	3.2	2.4 - 3.4	3.3	3.2
Interorbital width	6.4	5.4 - 6.6	5.9	7.4
Internarial width	3.6	3.1 - 3.5	3.6	4.0
Labial furrow:				
upper	2.7	2.7 - 2.9	2.7	2.7
lower	2.0	1.5 - 2.1	2.1	2.0
Interspace between:				
1st and 2nd dorsal	9.0	8.3 - 9.4	9.0	9.2
nostril and mouth	1.8	1.5 - 2.2	1.6	1.6
Distance between:				
origins of paired fins	22.0	19.8 - 22.1	23.8	17.0
axils of two dorsal fins	15.4	14.2 - 15.6	15.6	14.2
First dorsal fin:				
vertical height	2.1	2.5 - 2.8	2.4	1.7
base length	6.6	5.1 - 7.0	6.8	6.0
Second dorsal fin:				
vertical height	2.6	3.0 - 3.4	2.7	2.1
base length	6.1	5.9 - 6.3	6.4	6.5
Anal fin:				
vertical height	5.4	5.3 - 6.1	5.3	4.3
base length	14.5	14.9 - 15.6	13.3	14.9
Caudal fin:				
peduncle height	4.1	4.4 - 4.7	4.5	4.5
lower origin to tip	28.5	28.6 - 29.2	26.8	33.0
Tooth rows:				
upper	102	80 - 99	87	70
lower	106	82 - 99	broken	68
Vertebrae:				
monospondylous	43	42 - 43	41	43
precaudal diplospondylous	no data	30 - 33	no data	no data
Spiral valves	broken	17 - 20	20	18

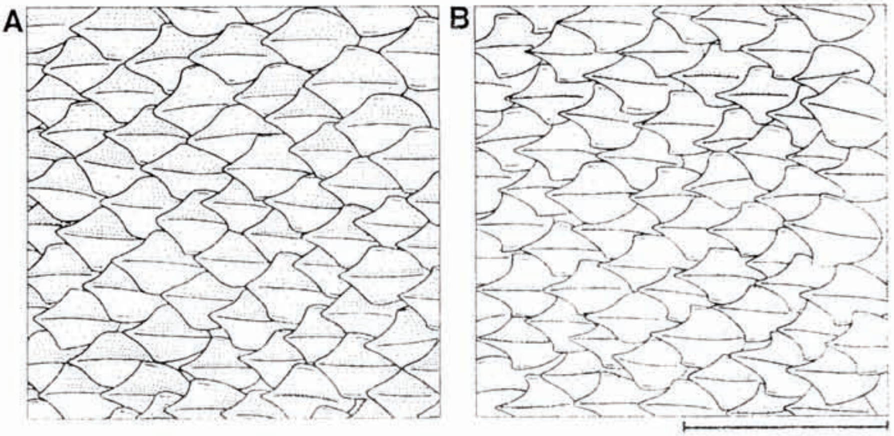

Fig. 4. - Dermal denticles of the holotypes from dorsolateral side of body. (A) *Apristurus laurussonii* (NHMR, 663 mm TL, female; (B) *A. maderensis* (MMF 18750, 665 mm TL, female). Scale bar = 1 mm.

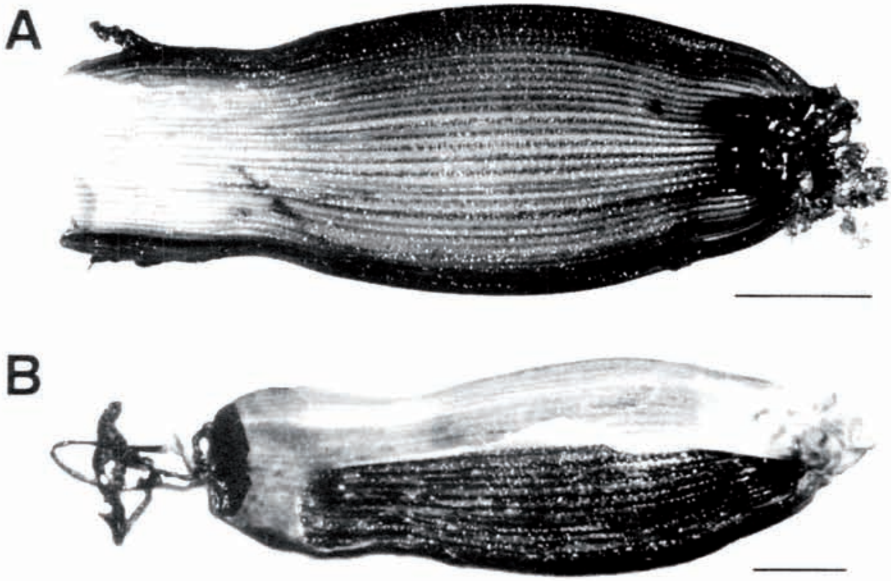

Fig. 5. - Egg capsules. (A) *Apristurus laurussonii* (ISH 23-1981, 622 mm TL); (B) Holotype of *A. maderensis* (MMF 18750, 665 mm TL, female). Scale bar = 1 cm.

bases wide, always more than 12% TL; distance between origins of paired fins about 20% TL or more, much longer than distance from snout tip to pectoral origin or length of anal fin base. First dorsal fin slightly smaller than second dorsal fin; first dorsal fin origin above posterior two thirds of pelvic fin base; its axil in front of anal fin origin. Second dorsal fin origin slightly behind middle point of anal base; axil just above or slightly in front of that of anal fin base. Distance between axils of two dorsal fins about 15% TL, and a little longer than length of anal fin base. Anal fin high, subangular at its anterior corner; length of its base short, about equal to distance from snout tip to spiracle. Caudal fin moderately short, separated from anal fin only by a notch; length from lower origin to tip less than 30% TL in mature specimens; its lower lobe moderately large, subangular, much higher than anal fin.

Skin velvety to touch; dermal denticles on body small, numerous and greatly overlapping; denticles on dorsolateral surface of trunk mostly with one conspicuous central cusp and two indistinct lateral cusps, with three weak ridges; number of dermal denticles on dorsolateral side of trunk from 61 to 75 in a 2x2 mm square (Fig. 4). Denticles on upper margin of caudal fin a little larger than those of other parts of body, not forming a crest-like ridge.

Teeth small and numerous on both jaws, usually possessing 5 cusps; central cusp much longer than lateral ones; number of tooth rows along entire jaw 80-102 on upper, and 82-106 on lower jaw. Number of monospondylous vertebrae 41-43; precaudal diplospondylous vertebrae (counts before origin of lower caudal fin lobe) 30-33. Number of spiral valves 17-20.

Color in alcohol uniformly light brown or yellowish brown, with rather dark colored fin lobes and edges of snout; naked areas of fin margins blackish brown.

Egg capsule thick (Fig. 5); capsule from a 622.0 mm TL female (ISH 23-1981) 62.6 mm in length and 24.6 mm in its greatest width (Fig. 5A); anterior end forming an angle, with a long, weak fibrous thread on each corner; neckline at anterior one third of the capsule; posterior end forming two small horn-like processes, from each of which a long and thin coiled tendril extending; lateral edge flanged, forming keel-like ridge; surface of capsule entirely covered by villus-like fibers which form numerous fine striations.

DISCUSSION

Thirty-three species are currently recognized for the genus *Apristurus*, and nine are nominally known from the North Atlantic Ocean: *Apristurus profundorum* (Goode & Bean, 1885); *A. laurussonii* (Saemundsson, 1922); *A. atlanticus* (Koefoed, 1927); *A. riveri* Bigelow & Schroeder, 1944; *A. maderensis* Cadenat & Maul, 1966; *A. canutus* Springer & Heemstra, 1979; *A. manis* (Springer, 1979); *A. parvipinnis* Springer & Heemstra, 1979; *A. aphyodes* Nakaya & Stehmann, 1998. Among these North Atlantic species, three species, *A. laurussonii*, *A. atlanticus* and *A. maderensis* are similar in morphology and possess following characters in common: origin of first dorsal fin above pelvic base, high anal fin with a short base, larger number of spiral valves, and upper labial furrows which are longer than lower ones.

The holotypes of *A. laurussonii* and *A. maderensis* are females of almost the same size (663 mm TL and 665 mm TL, respectively). Their general morphological features are quite similar to each other in having first dorsal fin originating above posterior two thirds of pelvic fin base, slightly smaller first dorsal fin than second dorsal fin, small pectoral fin which does not extend to middle point of interspace of pectoral and pelvic fins, distance between origins of pectoral and pelvic fins greater than length from snout tip to pectoral fin origin (Figs 1, 2), and broad and short snout with rather widely separate nostrils (Fig. 3). Dermal denticles of these holotypes are the same in shape and distribution (Fig. 4). Proportional measurements and meristic counts, such as numbers of tooth rows and vertebrae, do not seem to show any important differences (Table I). Therefore, we were not able to recognize any significant differences between the type specimens of *A. laurussonii* and *A. maderensis.*

Springer (1979) noted that the holotype of *A. maderensis* had an egg capsule with 20 or more prominent striations, which was confirmed by Nakaya (Fig. 5B). An egg capsule taken from a specimen of *A. laurussonii* (Fig. 5A) has prominent striations, similar to those of *A. maderensis*. Morphologically, egg capsules are identical in these two species.

Apristurus maderensis was diagnosed as having projecting medial lobes on gill-septa (Cadenat and Maul, 1966), and this character has been considered to be unique in this species (Springer, 1979; Compagno, 1984). The holotype of *A. laurussonii* was found to possess similar projecting medial lobes on gill-septa (Fig. 2A). Therefore, the presence of projection on gill-septa is not a specific diagnostic character of *A. maderensis*. In fact, other specimens of *A. laurussonii* from the type locality possess projecting medial lobes. Further, through our examination of more than 600 specimens of various *Apristurus* species, we have found a wide variation in the morphology of gill septa. For example, *A. platyrhynchus* from Japanese waters usually possesses weak projections on gill-septa, but such projections are sometimes absent. Compagno (1984) also suggested the variation of the character, referring to his specimens examined. These facts indicate that this character is variable within a species, and is unreliable in the taxonomy of the genus *Apristurus*.

Springer (1973) considered *A. atlanticus* a synonym of *A. laurussonii,* but later he separated it from *A. laurussonii* (Springer, 1979, 1990), stating that it was not clear that it belongs in synonymy. In his influential work on sharks of the world, Compagno (1984) erroneously described and gave figures of *A. atlanticus* (p. 261-262, figs), and his *A. atlanticus* is correctly *A. aphyodes* which was recently described by Nakaya and Stehmann (1998). *A. atlanticus* is, in fact, a poorly known species, described from a single immature male of 247 mm TL (Koefoed, 1927). Based on our examination of the holotype (ZMUB 3203), *A. atlanticus* is distinguishable from *A. laurussonii* and *A. maderensis* by the following morphological characteristics, meristic counts and proportional measurements: origin of first dorsal fin above posterior end of pelvic fin base (above posterior two thirds of pelvic fin base in *A. laurussonii* and *A. maderensis*), shorter distance between origins of pectoral and pelvic fins than that from snout tip to pectoral fin (longer in the two species), 70 and 68 tooth rows on upper and lower jaws, respectively (80 -102 and 82 -106 rows), and narrower dorsal fins (wider) (Table I).

In summary, no significant difference was found in the type specimens of *Apristurus laurussonii* and *A. maderensis,* and we conclude that *A. maderensis* Cadenat & Maul, 1966 is a junior synonym of *A. laurussonii* (Saemundsson, 1922).

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